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(71) Applicant: **Unex Corporation**
Mahwah, New Jersey 07430 (US)

(72) Inventors:
- **Junkers, John K.**
  Saddle River, New Jersey 07458 (US)
- **Koppenhoefer, Peter**
  Portland, PA 18351 (US)

(74) Representative: **Hanson, William Bennett**
J.Y. & G.W. Johnson,
Kingsbourne House,
229-231 High Holborn
London WC1V 7DP (GB)

(54) Fluid-operated torque wrench

(57) A fluid operated torque wrench has a housing having a cylinder portion (2) with a cylinder (4) having an axis (A) and a driving portion (3); two pistons (5, 8) movable in the cylinder along the axis (A) independently from one another and having piston rods (6, 9); two ratchet-lever mechanisms (15, 19) located in the driving portion (3); a drive element (18) to which both the ratchet-lever mechanisms are connected; and a fluid supply (16, 17) into the cylinder, the pistons (5, 8) being formed so that when the fluid is supplied at opposite sides of the pistons, either one ratchet-lever mechanism (15) turns and the other (19) ratchets, or vice versa.

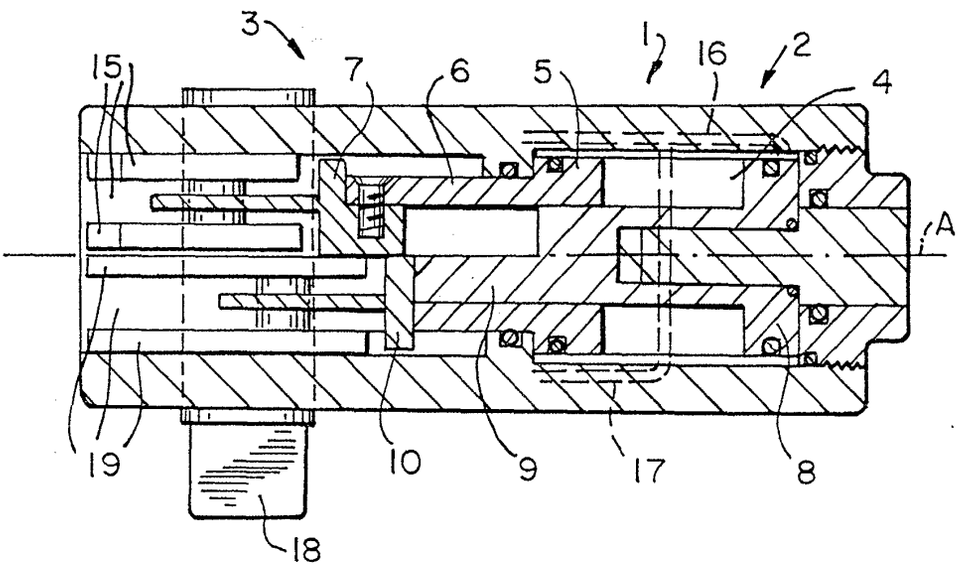


FIG. 2

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Description

[0001] The present invention relates to fluid operated torque wrenches.

[0002] Fluid operated torque wrenches are known and widely utilized. Especially advantageous are fluid operated torque wrenches which provide continuous rotation of a drive element connected to a threaded fastener, such as a bolt, a nut, or the like and provide continuous turning and tightening of these fastening elements. It is believed that the existing fluid operated torque wrenches of the above mentioned general type can be further improved.

[0003] US-A-4,409,865 describes a continuous ratchet drive for a wrench, comprising a pair of drive pawls for engaging and driving a ratchet gear. The pawls are mounted on a tiltable lever. On a forward stroke of the lever, one of the pawls drives the gear in one direction, and on a reverse stroke of the lever, the other pawl drives the gear in the same direction. However, difficulties can arise in disengaging the pawls from the gear, particularly when the wrench is engaged with a bolt that has been over-tightened.

[0004] Accordingly, it is an object of the present invention to provide a fluid operated torque wrench for a continuous rotation, which is a further improvement of the existing torque wrenches of this type.

[0005] In keeping with this object and with others which will become apparent hereinafter, one feature of present invention resides, briefly stated, in a fluid operated torque wrench which has a housing having a cylinder portion with a cylinder having an axis and a driving portion; two pistons movable in said cylinder along said axis independently from one another and having piston rods; two ratchet-lever mechanisms located in said driving portion; a drive element to which both said ratchet-lever mechanisms are connected; means for supplying a fluid into said cylinder, said pistons being formed so that when the fluid is supplied by said fluid supplying means at one side of one of said pistons and at another opposite side of the other of said pistons as considered as in axial direction, said one piston moves in one axial direction allowing one of said ratchet-lever mechanisms to ratchet while said other piston moves in an opposite axial direction to turn the other ratchet-lever mechanism so as to turn said drive element, while when the fluid is supplied at the other side of said one piston and simultaneously at one side of said other piston as considered in the axial direction said one piston moves in said other axial direction to turn said one ratchet-lever mechanism to turn said drive element while said other piston moves in said one axial direction allowing said one ratchet-lever mechanism to ratchet.

[0006] The torque wrench may comprise a reaction portion or support structure which is coaxial with the drive portion of the tool (not to be confused with the driving portion of the housing), as shown in US-A-4,706,527. In an alternative embodiment the torque wrench may comprise a reaction portion on the cylinder portion of the housing, such as the plate shown in US-A-4,201,099, a drive portion of the wrench preferably being located in or on the driving portion of the housing.

[0007] When the fluid-operated torque wrench is designed in accordance with the present invention, it is a further improvement of the fluid-operated wrenches for continuous rotation of a threaded fastener.

[0008] The invention will be best understood from the following description of specific embodiments, given by way of example only, when read in connection with the accompanying drawings, in which:

Figure 1 is a front view of a fluid operated torque wrench in accordance with the present invention; and

Figure 2 is a top view of the inventive fluid operated torque wrench, in a cross-section.

[0009] A fluid operated torque wrench in accordance with the present invention has a housing which is identified as a whole with reference numeral 1 and has a first housing portion 2 which is formed as a cylinder portion, and a second housing portion 3 which is formed as a driving portion. The cylinder portion 2 which forms a cylinder 4 has an axis which is identified as A. Two pistons are accommodated in the cylinder 4 of the cylinder portion 2 and are reciprocatingly movable in direction of the axis A independently from one another. One piston which is identified with reference numeral 5 and has a hollow piston rod 6 with a rod end 7 connected to it. The other piston 8 has a solid piston rod 9 extending through the hollow piston 5 and having a second rod end 10 connected therewith.

[0010] The fluid operated torque wrench further has two ratchet-lever mechanisms which are known per se and each include drive plates, a ratchet located between the drive plates, a pawl arranged on the drive plates and engageable with the ratchet. Figure 1 shows one of the ratchet lever mechanisms 11 which has drive plates 12 (only one shown), a ratchet 13 turnably arranged between said drive plates, and a pawl 14 turnably mounted on one of the drive plates 12 and engageable with the ratchet 13. The ratchet lever mechanism 11 is connected with the rod end 10 of the rod 9 of the piston 8. The other ratchet lever mechanism 15 is connected with the rod end 7 of the piston rod 6 of the piston 5.

[0011] Finally, the fluid operated torque wrench has means for supplying a power fluid from a not shown source of the power fluid. The fluid supplying means includes a first fluid supplying system 16 and a second fluid supplying system 17 shown in Figure 2. The first fluid supplying system 16 includes fluid supplying channels formed to supply the fluid at one side of the piston 5 and at an opposite, other side of the piston 8 as considered in an axial direction, while the second fluid supplying system 17 includes fluid supplying channels for

supplying the fluid at the opposite side of the piston 5 and at the one side of the piston 8.

[0012] The fluid operated wrench further has a drive element which is identified with reference numeral 18. The drive element 18 is common for both ratchet lever mechanisms 11 and 15 and connected with the ratchets of the both mechanisms so as to be turned when the ratchet of any of the ratchet lever mechanisms 11, 15 is turned.

[0013] The fluid-operated torque wrench operates in the following manner.

[0014] When the fluid is supplied through the fluid supply system 16, the fluid acts on the piston 5 from one side or the left side in Figure 2 and also acts on the piston 8 from the other opposite side or the right side, the piston 5 moves to the right allowing the ratchet lever mechanism 15 to ratchet, while the piston 8 is moved to the left to turn the ratchet-lever mechanism 11 so as to turn the drive element 18. When thereafter the fluid is supplied through the fluid system 17 so as to act on the piston 5 from the opposite side or the right side and to act on the piston 8 from the one side or the left side, then the piston 5 is moved to the left and the piston 8 is moved to the right, so that the ratchet-lever mechanism 15 turns the drive element 18, while the ratchet-lever mechanism 11 is allowed to ratchet. Thus, a continuous turning of the drive element 18 is provided.

[0015] As can be seen from the drawings, one of the pistons has a second piston rod which extends to the right and has the same diameter as the piston rod 9 of the piston 8, to assure that both pistons 5 and 8 have the same piston area at the right side.

[0016] As mentioned above, as one of the pistons moves its ratchet lever mechanism to turn the ratchet forwards, the other piston moves the other ratchet lever mechanism to ratchet backwards. Therefore, with the same number of ratchet teeth as a regular wrench, which has just one forward stroke to turn the ratchet and one reverse stroke to ratchet, each piston needs to move only half the distance and since one ratchet lever mechanism is always engaged with a ratchet tooth, less overstroke is necessary.

[0017] Additionally, the present invention is an improvement over US-A-4,409,865, in which both pawls are dependent on one and the same lever mechanism. In the present invention, ceasing the fluid supply returns both ratchet lever mechanisms instead of having them move in opposite directions. Thus the tool lets the bolt unwind and can be removed.

[0018] It will be understood that each of the elements described above, or two or more together, may also find a useful application in other types of constructions differing from the types described above.

[0019] While the invention has been illustrated and described as embodied in a fluid-operated torque wrench, it is not intended to be limited to the details shown, since modifications and structural changes may be made without departing in any way from the scope of the appended claims.

Claims

1. A fluid operated torque wrench, comprising a housing having a cylinder portion (2) with a cylinder (4) having an axis (A), and a driving portion (3); **characterised by** two pistons (5, 8) movable in said cylinder along said axis independently from one another and having piston rods (6, 9); two ratchet-lever mechanisms (11, 15) located in said driving portion (3); a drive element (18) to which both said ratchet lever-mechanisms are connected; means (16, 17) for supplying a fluid into said cylinder (4), said pistons (5, 8) being formed so that when the fluid is supplied by said fluid supplying means (16, 17) at one side of one (5) of said pistons and at another opposite side of the other (8) of said pistons as considered in an axial direction, said one piston (5) moves in one axial direction allowing one (11) of said ratchet-lever mechanisms to ratchet while said other piston (8) moves in an opposite axial direction to turn the other ratchet-lever mechanism (15) so as to turn said drive element (18), while when the fluid is supplied at the other side of said one piston (5) and simultaneously at one side of said other piston (8) as considered in the axial direction said one piston (5) moves in said other axial direction to turn said one ratchet-lever mechanism (11) to turn said drive element (18) while said other piston (8) moves in said other axial direction allowing said other ratchet lever mechanism (15) to ratchet.

2. A fluid operated torque wrench as defined in claim 1, wherein one (5) of said pistons is hollow and has a hollow piston rod (6) to which a first rod end (7) is connected, while the other (8) of said pistons has a solid piston rod (9) extending into said hollow piston rod (6) and having a second rod end (10), said rod ends (7, 10) being connected to corresponding ones of said ratchet-lever mechanisms (11, 15).

3. A fluid operated torque wrench as defined in claim 2, wherein said other piston (8) has a second piston rod having the same diameter as said solid piston rod (9) to assure that said pistons (5, 8) have the same piston area at said opposite side.

4. A fluid operated torque wrench as defined in claim 1, 2 or 3, comprising a reaction portion, which is coaxial with the drive portion of the tool.

5. A fluid operated torque wrench as defined in claim 1, 2 or 3, comprising a reaction portion on the cylinder portion of the housing.

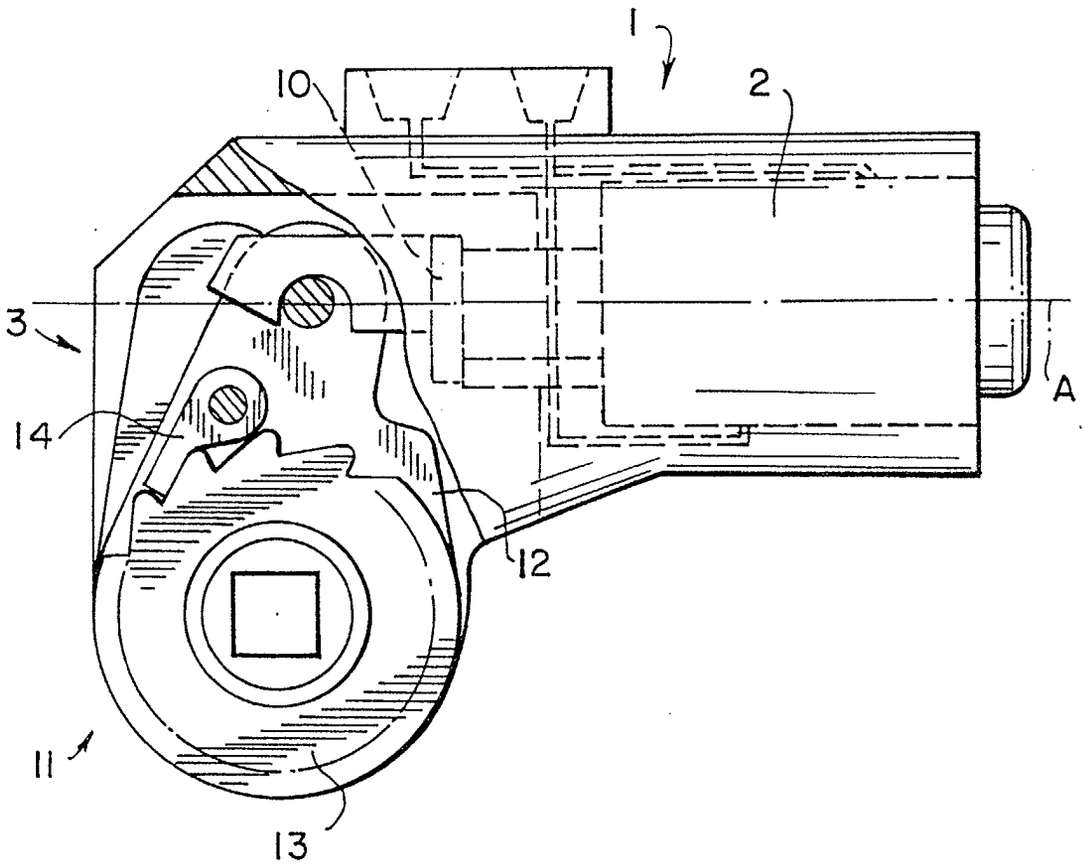


FIG. 1

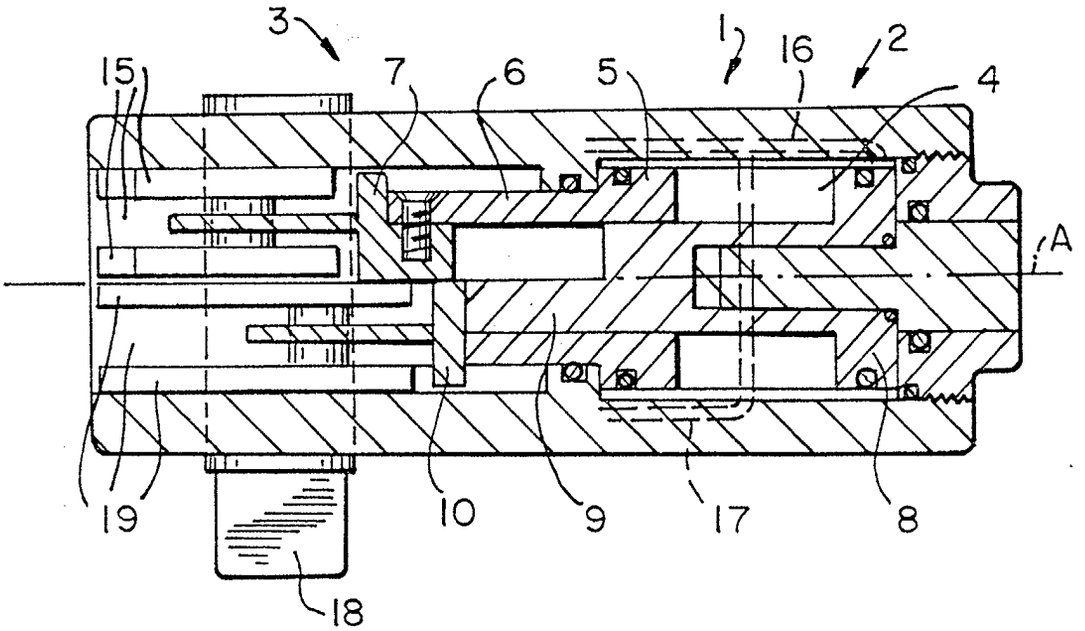


FIG. 2

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EUROPEAN SEARCH REPORT

Application Number
EP 03 25 0013

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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
MUNICH	21 March 2003	Kühn, T

CATEGORY OF CITED DOCUMENTS

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